Claims

1. A transverse type induction heating apparatus in which inductors including iron cores and coils wound around the iron cores are disposed between a rough rolling mill and a finish rolling mill of a steel hot-rolling line so as to be opposite to each other across a material to be rolled, and the material to be rolled, which is conveyed by a conveying roll, is heated by the inductors to which electric power is supplied from an AC power source, the transverse type induction heating apparatus being characterized in that

iron core widths of the inductors in a plate width direction of the material to be rolled are made smaller than a plate width of the material to be rolled, they are disposed on a plate width center line of the material to be rolled, and when a current penetration depth is made δ (m), a specific resistance of the material to be rolled is made ρ (Ω-m), a magnetic permeability of the material to be rolled is made μ (H/m), a heating frequency of the AC power source is made f (Hz), a circular constant is made π, and a plate thickness of the material to be rolled is made tw (m),

the heating frequency of the AC power source is set to cause the current penetration depth δ of expression (1) set forth below to satisfy expression (2) set forth below

$$\delta = \sqrt{\frac{\rho}{\mu \cdot f \cdot \pi}} \quad \cdots (1)$$

$$\frac{tw}{\delta} < 0.95 \quad \cdots (2).$$

2. A transverse type induction heating apparatus according to claim 1, characterized in that the inductor includes plural magnetic poles.

3. A transverse type induction heating apparatus according to claim 1 or 2, characterized in that the respective coils are connected in series to each other.

4. A transverse type induction heating apparatus according to any one of claims 1 to 3, characterized in that the respective inductors can be moved in a plate thickness direction of the material to be rolled by lifting and lowering means.

5. A transverse type induction heating apparatus according to any one of claims 1 to 4, characterized in that at least two pairs of the inductors are disposed in a traveling direction of the material to be rolled, and the conveying roll is disposed between the inductors.

6. A transverse type induction heating apparatus according to claim 5, characterized in that the iron core of each of the inductors is disposed on the plate width center line of the material to be rolled.

7. A transverse type induction heating apparatus

according to claim 5 or 6, characterized in that a surface of the conveying roll is coated with an electrical insulating member.

8. A transverse type induction heating apparatus according to claim 1, characterized in that the plural inductors are disposed from an upstream side to a downstream side of the steel hot-rolling line, the AC power sources are individually connected to the respective inductors, and when heating frequencies of the AC power sources are made F1, F2, · · · Fn from an upstream side of the steel hot-rolling line, and K is made K = 1.05 to 1.20, the heating frequencies of the respective AC power sources are set to satisfy a relation of expression (3) set forth below

$$F1 > F2 \times K > \cdots > Fn \times K^{n-1} \quad \cdots (3).$$